



TEST REPORT

Report No.	CTC20230976E11
Applicant	Lumi United Technology Co., Ltd
Address.....	Room 801-804, Building 1, Chongwen Park, Nanshan iPark, No. 3370, Liuxian Avenue, Fuguang Community, Taoyuan Residential District, Nanshan District, Shenzhen, China
Manufacturer.....	Lumi United Technology Co., Ltd
Address.....	Room 801-804, Building 1, Chongwen Park, Nanshan iPark, No. 3370, Liuxian Avenue, Fuguang Community, Taoyuan Residential District, Nanshan District, Shenzhen, China
Product Name	Temperature and Humidity Sensor T1
Trade Mark	Aqara
Model/Type reference.....	WS-S01
Listed Model(s)	WSDCGQ12LM-G0, WSDCGQ12LM, TH-S02D
Standard	AS/NZS 4268: 2017 + Amd 1: 2021
Date of receipt of test sample....	Apr. 16, 2019
Date of testing.....	Apr. 17, 2019 ~ Apr. 27, 2019 and Apr. 22, 2023 ~ Apr. 28, 2023
Date of issue.....	May. 05, 2023
Result.....	PASS

Compiled by: (Printed name+signature)	Terry Su	
Supervised by: (Printed name+signature)	Eric Zhang	
Approved by: (Printed name+signature)	Totti Zhao	
Testing Laboratory Name	CTC Laboratories, Inc.	
Address.....	2/F., Building 1 and 1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Longhua District, Shenzhen, Guangdong, China	

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Any objections must be raised to CTC within 15 days since the date when the report is received. It will not be taken into consideration beyond this limit. The test report merely correspond to the test sample.

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1. TEST SUMMARY

1.1. Test Standards

The tests were performed according to following standards:

[AS/NZS 4268: 2017 + Amd 1: 2021](#)— Radio equipment and systems—Short range devices—Limits and methods of measurement

[ETSI EN 300 328 V2.2.2: 2019-07](#)—Wideband transmission systems; Data transmission equipment operating in the 2.4 GHz ISM band and using wide band modulation techniques; Harmonised Standard for access to radio spectrum

[ETSI EN 300 440 V2.2.1: 2018-07](#)— Short Range Devices (SRD); Radio equipment to be used in the 1 GHz to 40 GHz frequency range; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

1.2. Report version

Revised No.	Date of issue	Description
01	May. 05, 2023	Original



1.3. Test Description

Radio Spectrum Matter (RSM) Part of Transmitter			
Test Item of AS/NZS 4268	AS/NZS 4268 Test require	Result	Test Engineer
Maximum EIRP	clause 6.3	Pass	Alicia Liu
Emission bandwidth limits& Operating frequencies	clause 6.5 & 6.6	Pass	Alicia Liu
Transmitter spurious emissions	clause 6.4	Pass	Alicia Liu

Radio Spectrum Matter (RSM) Part of Receiver			
Test Item of AS/NZS 4268	AS/NZS 4268 Test require	Result	Test Engineer
Receiver spurious emissions	clause 7.2	Pass	Alicia Liu

Note:

1. The measurement uncertainty is not included in the test result.
2. N/A: means this test item is not applicable for this device according to the technology characteristic of device.



1.4. Test Facility

CTC Laboratories, Inc.

Add: 2/F., Building 1 and 1-2/F., Building 2, Jiaquan Building, Guanlan High-Tech Park, Longhua District, Shenzhen, Guangdong, China

Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

A2LA-Lab Cert. No.: 4340.01

CTC Laboratories, Inc. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

Industry Canada (Registration No.: 9783A, CAB Identifier: CN0029)

CTC Laboratories, Inc. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 9783A on Jan, 2016.

FCC (Registration No.: 951311, Designation Number CN1208)

CTC Laboratories, Inc. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 951311, Aug 26, 2017.

1.5. Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2" and is documented in the CTC Laboratories, Inc. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Below is the best measurement capability for CTC Laboratories, Inc.



Test Items	Measurement Uncertainty	Notes
Maximum transmit power	±1.5dB	(1)
Occupied Channel Bandwidth	±5%	(1)
Transmitter unwanted emissions in the spurious domain	±2.8dB	(1)
Receiver spurious emissions	±2.8dB	(1)

Note(1): This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

1.6. Environmental conditions

Normal Condition	Temperature	15 °C to +35 °C
	Relative humidity	20 % to 75 %.
	Voltage	The equipment shall be the nominal voltage for which the equipment was designed.
Extreme Condition	Temperature	Measurements shall be made over the extremes of the operating temperature range as declared by the manufacturer
	Voltage	Measurements shall be made over the extremes of the operating temperature range as declared by the manufacturer

Normal Condition	T_N =Normal Temperature	25 °C
Extreme Condition	T_L =Lower Temperature	-20 °C
	T_H =Higher Temperature	50 °C



2. GENERAL INFORMATION

2.1. Client Information

Applicant:	Lumi United Technology Co., Ltd
Address:	Room 801-804, Building 1, Chongwen Park, Nanshan iPark, No. 3370, Liuxian Avenue, Fuguang Community, Taoyuan Residential District, Nanshan District, Shenzhen, China
Manufacturer:	Lumi United Technology Co., Ltd
Address:	Room 801-804, Building 1, Chongwen Park, Nanshan iPark, No. 3370, Liuxian Avenue, Fuguang Community, Taoyuan Residential District, Nanshan District, Shenzhen, China

2.2. General Description of EUT

Product Name:	Temperature and Humidity Sensor T1
Trade Mark:	Aqara
Model/Type reference:	WS-S01
Listed Model(s):	WSDCGQ12LM-G0, WSDCGQ12LM, TH-S02D
Model Difference:	All these models are identical in the same PCB, layout and electrical circuit, only named differently for marketing purpose.
Power supply:	3Vdc from button battery
Hardware version:	V1.0.1
Software version:	V1.0.1

Technical index for Zigbee

Modulation:	O-QPSK
Operation frequency:	2405-2480MHz
Channel number:	16
Channel separation:	5 MHz
Antenna type:	PCB Antenna
Antenna gain:	2dBi

EUT Classification

Type of equipment:	<input type="checkbox"/> Stand alone equipment <input type="checkbox"/> Plug in radio equipment <input checked="" type="checkbox"/> Combined equipment
Modulation types:	<input checked="" type="checkbox"/> Wide Band Modulation (None Hopping – e.g. DSSS, OFDM) <input type="checkbox"/> Frequency Hopping Spread Spectrum (FHSS)
Adaptive/Non- adaptive:	<input checked="" type="checkbox"/> Adaptive, LBT-based <input type="checkbox"/> HFSS The maximum number of Hopping Frequencies:/ The minimum number of Hopping Frequencies: / Max. Dwell time:/

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	<input type="checkbox"/> Frame Based <input type="checkbox"/> Load Based <input type="checkbox"/> switch dynamically between Frame Based and Load Based
	<input type="checkbox"/> Adaptive, non-LBT-based
	<input checked="" type="checkbox"/> Adaptive (Operating in a non-adaptive mode.)
	<input type="checkbox"/> Non- adaptive
Antennas and transmit operating modes:	Operating mode 1 (single antenna) <input checked="" type="checkbox"/> Equipment with only 1 antenna <input type="checkbox"/> Equipment with 2 diversity antennas but only 1 antenna active at any moment in time <input type="checkbox"/> Smart Antenna Systems with 2 or more antennas, but operating in a (legacy) mode where only 1 antenna is used.

Note: For more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.3. Description of Test Modes and Test Frequency

The EUT has been tested under typical operating condition. The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing.

Operation Frequency List:

Channel	Frequency (MHz)
11	2405
12	2410
13	2415
14	2420
15	2425
16	2430
17	2435
18	2440
19	2445
20	2450
21	2455
22	2460
23	2465
24	2470
25	2475
26	2480

Note: The line display in grey were the channel selected for testing



2.4. Accessory Equipment information

Equipment Information			
Name	Model	S/N	Manufacturer
Notebook	ThinkBook 14G3 ACL	MP246QDR	Lenovo
/	/	/	/
Cable Information			
Name	Shielded Type	Ferrite Core	Length
/	/	/	/
Test Software Information			
Name	Versions	/	/
QCOM	V1.6	/	/



2.5. Measurement Instruments List

Tonscend JS0806-2 Test system						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated until
1	Spectrum Analyzer	Rohde & Schwarz	FSU26	100105	Dec. 29, 2018	Dec. 29, 2019
2	Spectrum Analyzer	Rohde & Schwarz	FUV40-N	101331	Jun. 21, 2018	Jun. 22, 2019
3	MXG Vector Signal Generator	Agilent	N5182A	MY4742086 4	Dec. 29, 2018	Dec. 29, 2019
4	Signal Generator	Agilent	E8257D	MY4652190 8	Dec. 29, 2018	Dec. 29, 2019
5	Power Sensor	KEYSIGHT	U2021XA	MY5365004	Dec. 29, 2018	Dec. 29, 2019
6	Power Sensor	KEYSIGHT	U2021XA	MY5365006	Jun. 23, 2018	Dec 28 ,2019
7	Simultaneous Sampling DAQ	Agilent	U2531A	TW5449351 0	Jun. 23, 2018	Dec 28 ,2019
8	Climate Chamber	TABAI	PR-4G	A8708055	Dec. 29, 2018	Dec. 29, 2019
9	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	116410	Dec. 29, 2018	Dec. 29, 2019
10	Climate Chamber	ESPEC	MT3065	/	Dec. 29, 2018	Dec. 29, 2019
11	300328 v2.1.1 test system	TONSCEND	v2.6	/	/	/

Transmitter spurious emissions & Receiver spurious emissions						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated until
1	EMI Test Receiver	Rohde & Schwarz	ESCI	100658	Dec. 29, 2018	Dec. 29, 2019
2	High pass filter	micro-tranics	HPM50111	142	Dec. 29, 2018	Dec. 29, 2019
3	Log-Bicon Antenna	Schwarzbeck	CBL6141A	4180	Dec. 29, 2018	Dec. 29, 2019
4	Ultra-Broadband Antenna	ShwarzBeck	BBHA91 70	25841	Dec. 29, 2018	Dec. 29, 2019
5	Loop Antenna	LAPLAC	RF300	9138	Dec. 29, 2018	Dec. 29, 2019
6	Spectrum Analyzer	Rohde & Schwarz	FSU26	100105	Dec. 29, 2018	Dec. 29, 2019
7	Horn Antenna	Schwarzbeck	BBHA 9120D	647	Dec. 29, 2018	Dec. 29, 2019
8	Pre-Amplifier	HP	8447D	1937A0305 0	Dec. 29, 2018	Dec. 29, 2019
9	Pre-Amplifier	EMCI	EMC05183 5	980075	Dec. 29, 2018	Dec. 29, 2019
10	Antenna Mast	UC	UC3000	N/A	N/A	N/A
11	Turn Table	UC	UC3000	N/A	N/A	N/A
12	Cable Below 1GHz	Schwarzbeck	AK9515E	33155	Dec. 29, 2018	Dec. 29, 2019
13	Cable Above 1GHz	Hubersuhner	SUCOFLE X102	DA1580	Dec. 29, 2018	Dec. 29, 2019

Note: The cable loss has calculated in test result which connection between each test instruments

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Tonscend JS0806-2 Test system					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	MXA Signal Analyzer	Keysight	N9020A	MY46471737	Dec. 16, 2023
2	Spectrum Analyzer	R&S	FSU26	100105	Dec. 16, 2023
3	Spectrum Analyzer	R&S	FSV40-N	101331	Mar. 14, 2024
4	MXG Vector Signal Generator	Agilent	N5182A	MY47420864	Dec. 16, 2023
5	PSG Analog Signal Generator	Agilent	E8257D	MY46521908	Dec. 16, 2023
6	Power Sensor	Keysight	U2021XA	MY55130004	Mar. 14, 2024
7	Power Sensor	Keysight	U2021XA	MY55130006	Mar. 14, 2024
8	Wideband Radio Communication Tester	R&S	CMW500	102414	Dec. 16, 2023
9	High and low temperature box	ESPEC	MT3035	/	Mar. 24, 2024
10	JS1120 RF Test system	TONSCEND	v2.6	/	/

Radiated emission(3m chamber 2)					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Until
1	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	9168-1013	Dec. 07, 2024
2	Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-647	Dec. 07, 2024
3	Loop Antenna	LAPLAC	RF300	9138	Dec. 16, 2023
4	Spectrum Analyzer	R&S	FSU26	100105	Dec. 16, 2023
5	Spectrum Analyzer	R&S	FSV40-N	101331	Mar. 14, 2024
6	Pre-Amplifier	SONOMA	310	186194	Dec. 16, 2023
7	Low Noise Pre-Amplifier	EMCI	EMC051835	980075	Dec. 16, 2023
8	Test Receiver	R&S	ESCI7	100967	Dec. 16, 2023
9	3m chamber 2	Frankonia	EE025	/	Oct. 23, 2024

Radiated emission(3m chamber 3)					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated Until
1	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	01026	Dec. 18, 2024
2	Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-647	Dec. 01, 2024
3	Test Receiver	Keysight	N9038A	MY56400071	Dec. 16, 2023
4	Broadband Premplifier	SCHWARZBECK	BBV9743B	259	Dec. 16, 2023
5	Mirowave Broadband Amplifier	SCHWARZBECK	BBV9718C	111	Dec. 16, 2023
6	Pre-Amplifier	R&S	SCU-26	10033	Dec. 16, 2023
7	Pre-Amplifier	R&S	SCU-40	10030	Dec. 16, 2023
8	Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	BBHA 9170-497	Dec. 16, 2023
9	3m chamber 3	YIHENG	EE106	/	Sep. 09, 2023

Note: The cable loss has calculated in test result which connection between each test instruments.

3. TEST ITEM AND RESULTS

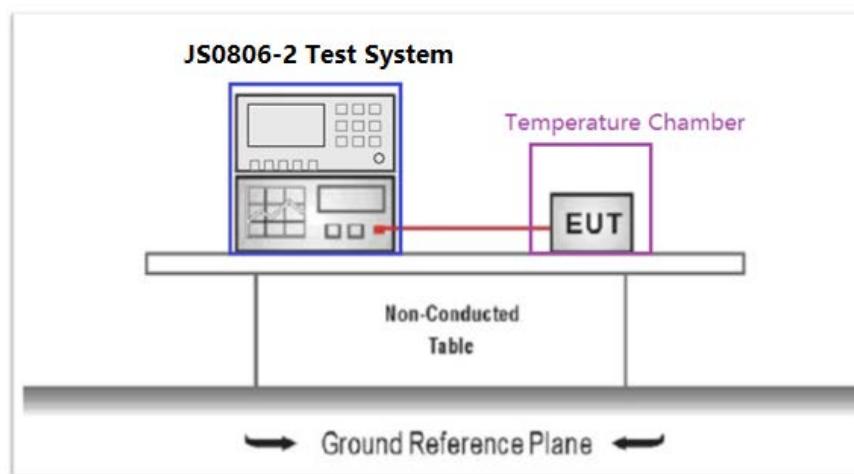
3.1. RF Output Power

Limit

AS/NZS 4268 Sub-clause 6.3 Table 1 and 2

Row	Class of transmitter	Permitted operating frequency band (MHz) (lower limit exclusive, upper limit inclusive)	Maximum EIRP	Test method	Other requirements
21	All transmitters	2 400 to 2 483.5	10 mW		
22	All transmitters	5 725 to 5 875	25 mW		
23	All transmitters	10 500 to 10 550 24 000 to 24 250 61 000 to 61 500 122 500 to 123 000 244 000 to 246 000	100 mW		

Test Configuration



Test Procedure

Please refer to ETSI EN 300 328 Sub-clause 5.4.2.2.1 for the measurement method.

Test Results



Test conditions	Channel	EIRP (dBm)	Limit (dBm)	Result
Temperature (°C)				
T_N	CH11	10.92	20.00	Pass
	CH18	10.91		
	CH26	10.81		
T_L	CH11	10.90	20.00	Pass
	CH18	10.89		
	CH26	10.82		
T_H	CH11	10.89	20.00	Pass
	CH18	10.87		
	CH26	10.84		

Note:

- 1) Test bursts: 45.
- 2) Measured Power(EIRP) include the cable loss and antenna gain.

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3.2. Occupied Channel Bandwidth and Operation Frequencies

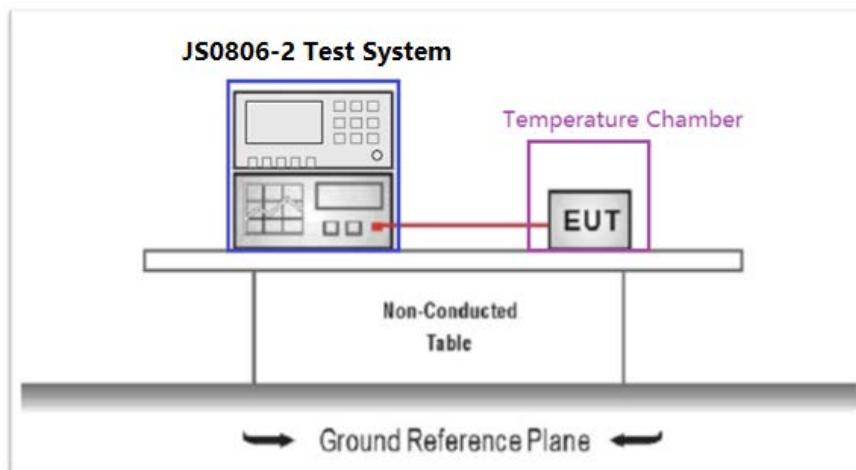
Limit

AS/NZS 4268 Sub-clause 6.6 Table 1 and 2

Row	Class of transmitter	Permitted operating frequency band (MHz) (lower limit exclusive, upper limit inclusive)	Maximum EIRP	Test method	Other requirements
21	All transmitters	2 400 to 2 483.5	10 mW		
22	All transmitters	5 725 to 5 875	25 mW		
23	All transmitters	10 500 to 10 550 24 000 to 24 250 61 000 to 61 500 122 500 to 123 000 244 000 to 246 000	100 mW		

For all equipment the frequency range shall lie within the frequency band.

Test Configuration

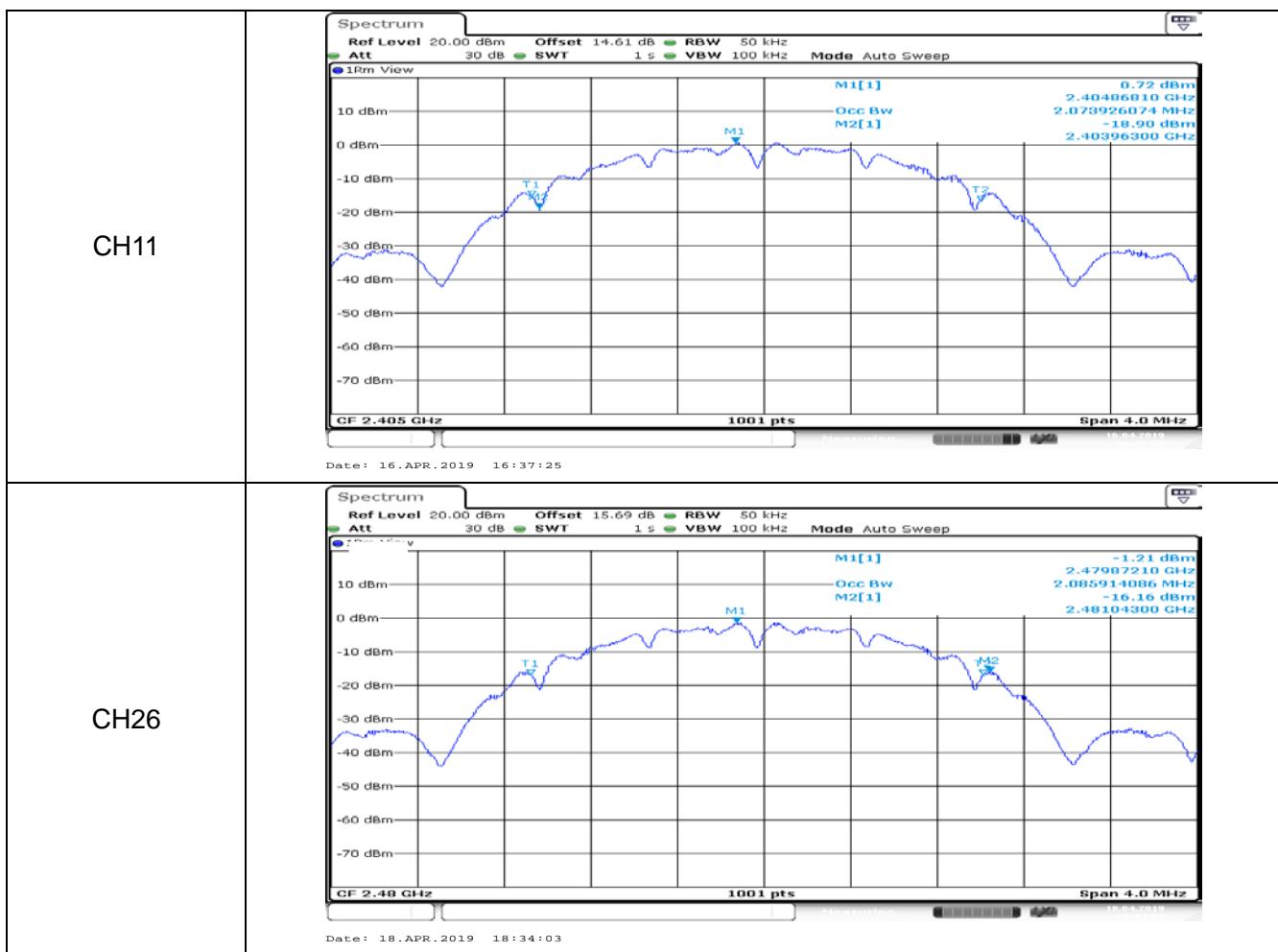


Test Procedure

Please refer to ETSI EN 300 328 Sub-clause 5.4.7.2.1 for the measurement method.

Test Result

Channel	99 % Bandwidth (MHz)	Measured Frequency (MHz)		Limit (MHz)	Result
		F _{lower}	F _{higher}		
CH11	2.074	2403.96	-	2400.00~2483.50	Pass
CH26	2.086	-	2481.04		



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3.3. Transmitter unwanted emissions in the spurious domain-Conducted measurements

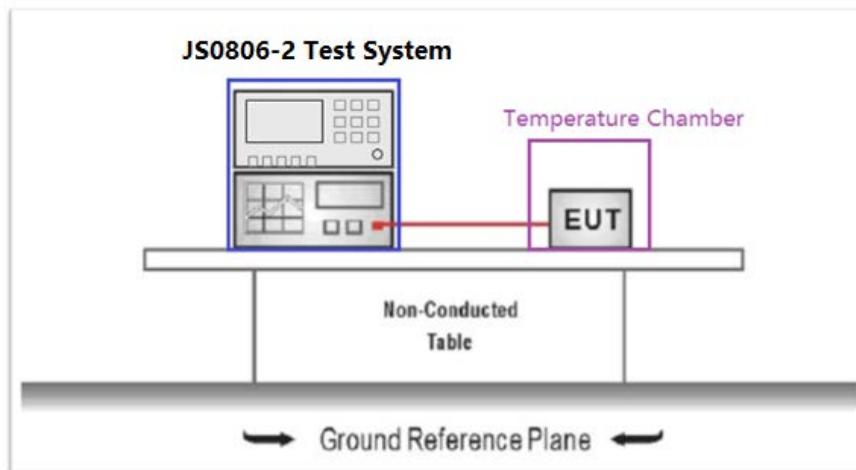
Limit

AS/NZS 4268 Sub-clause 6.2

The transmitter unwanted emissions in the spurious domain shall not exceed the values given in the below table

Frequency range	Maximum power	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87,5 MHz	-36 dBm	100 kHz
87,5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 694 MHz	-54 dBm	100 kHz
694 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 12,75 GHz	-30 dBm	1 MHz

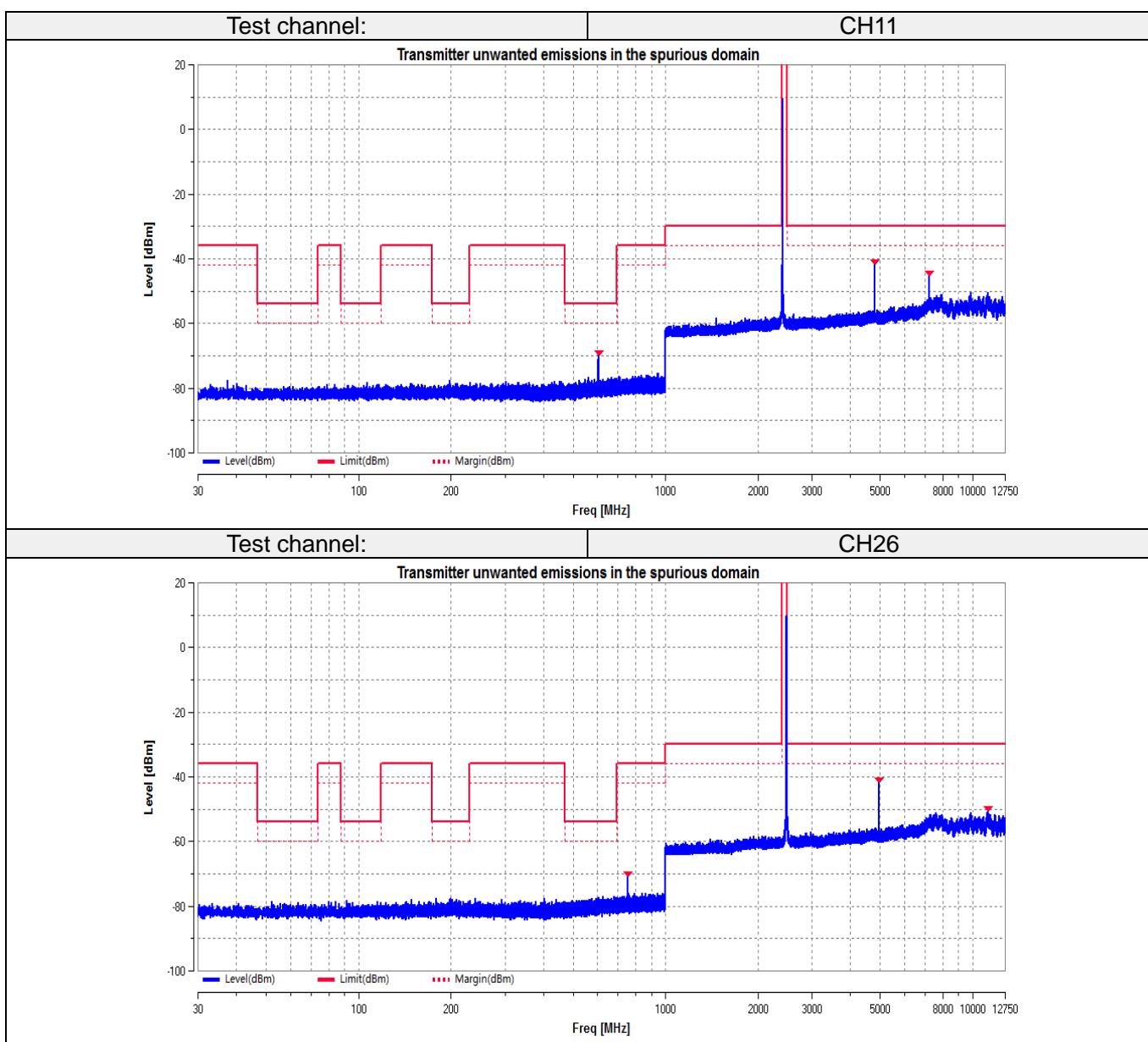
Test Configuration



Test Procedure

Please refer to ETSI EN 300 328 Sub-clause 5.4.9.2.2 for the measurement method.

Test Result



3.4. Transmitter unwanted emissions in the spurious domain-Radiated measurements

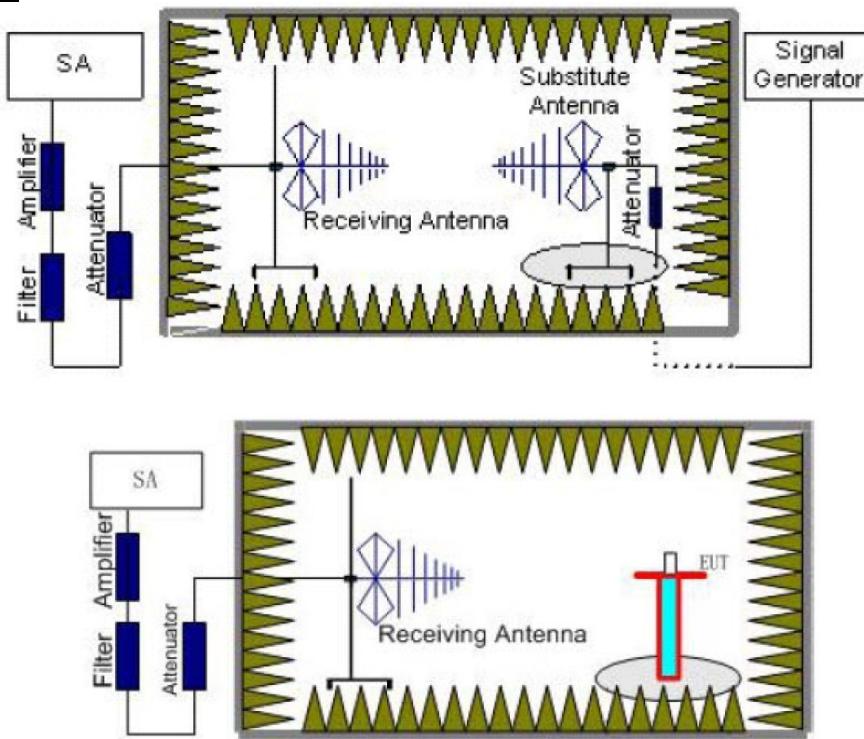
Limit

AS/NZS 4268 Sub-clause 6.2

The transmitter unwanted emissions in the spurious domain shall not exceed the values given in the below table

Frequency range	Maximum power	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
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174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 694 MHz	-54 dBm	100 kHz
694 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 12,75 GHz	-30 dBm	1 MHz

Test Configuration



Test Procedure

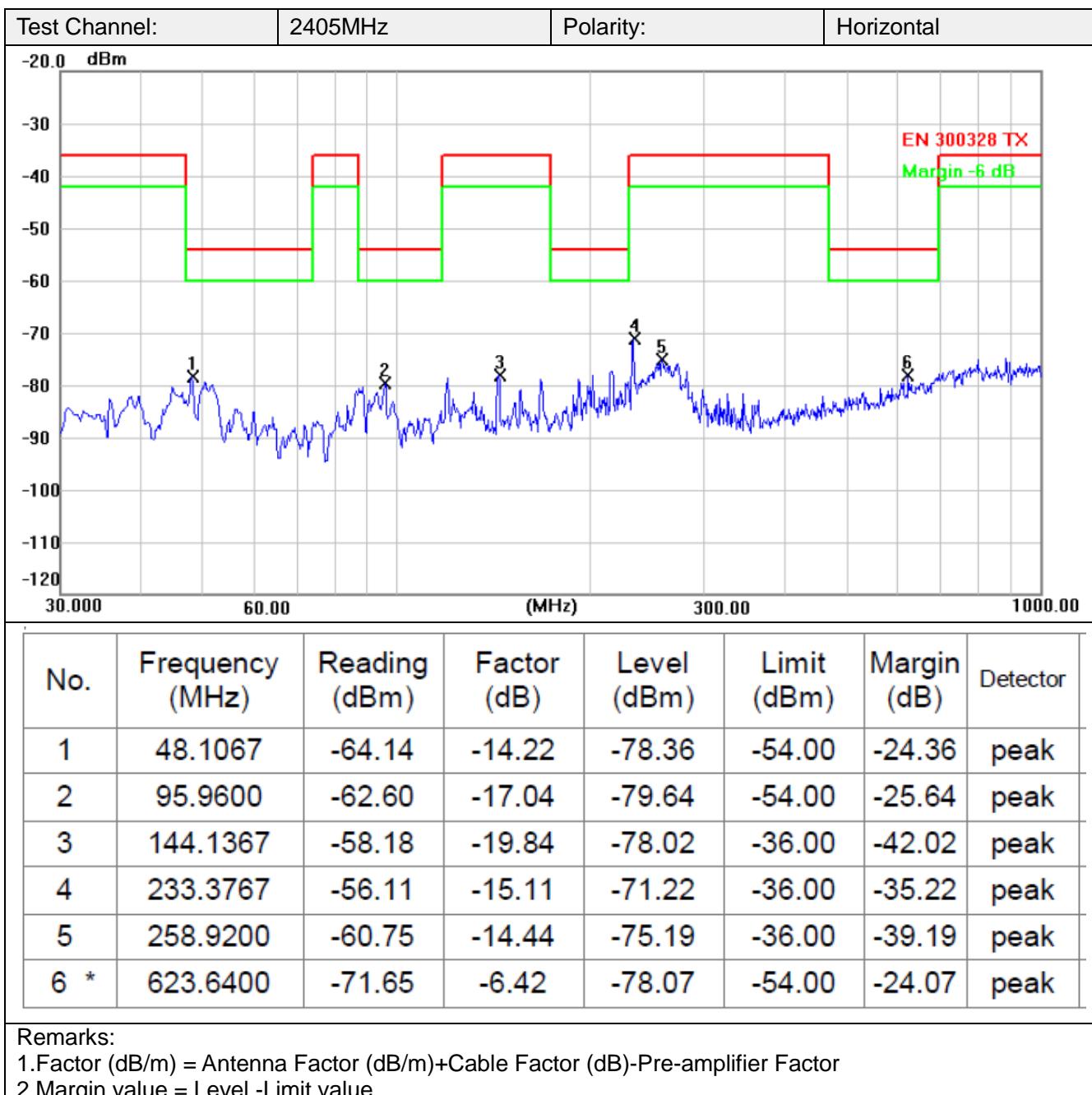
Please refer to ETSI EN 300 328 Sub-clause 5.4.9.2.2 for the measurement method.

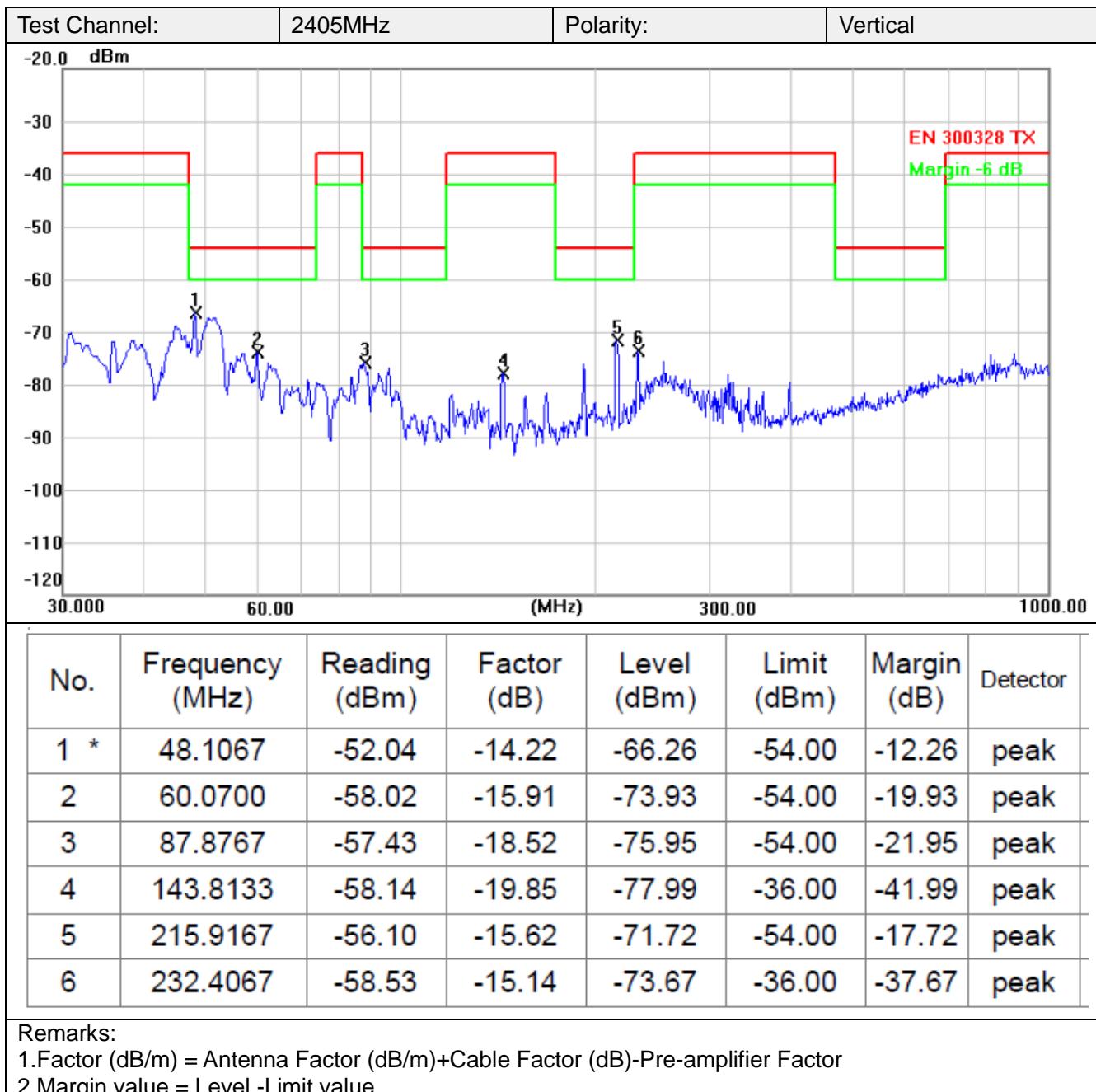
Test Result

Note:

1. By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "Z axis" position was the worst, and test data recorded in this report.

(1) Below 1G







(2) Above 1G

Channel	Frequency (MHz)	Spurious Emission		Limit (dBm)	Result	
		Polarization	Level (dBm)			
LCH	4810	Vertical	-57.91	-30	Pass	
	7215	Vertical	-56.63			
	9620	Vertical	-55.25			
	4810	Horizontal	-56.08	-30		
	7215	Horizontal	-55.02			
	9620	Horizontal	-54.53			
HCH	4810	Vertical	-55.67	-30		
	7215	Vertical	-55.29			
	9620	Vertical	-52.80			
	4810	Horizontal	-57.43	-30		
	7215	Horizontal	-55.33			
	9620	Horizontal	-54.16			

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3.5. Receiver spurious emissions-Conducted measurements

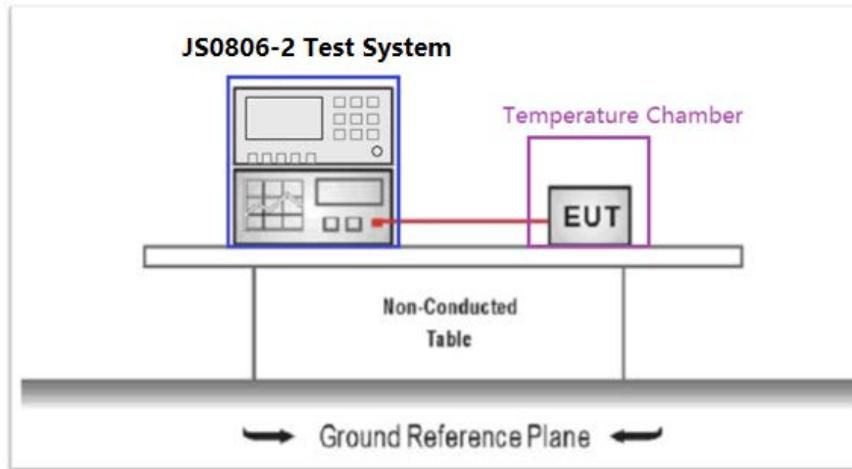
Limit

AS/NZS 4268 Sub-clause 7.2

The spurious emissions of the receiver shall not exceed the values given in the below table

Frequency range	Maximum power	Measurement bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 12.75 GHz	-47 dBm	1 MHz

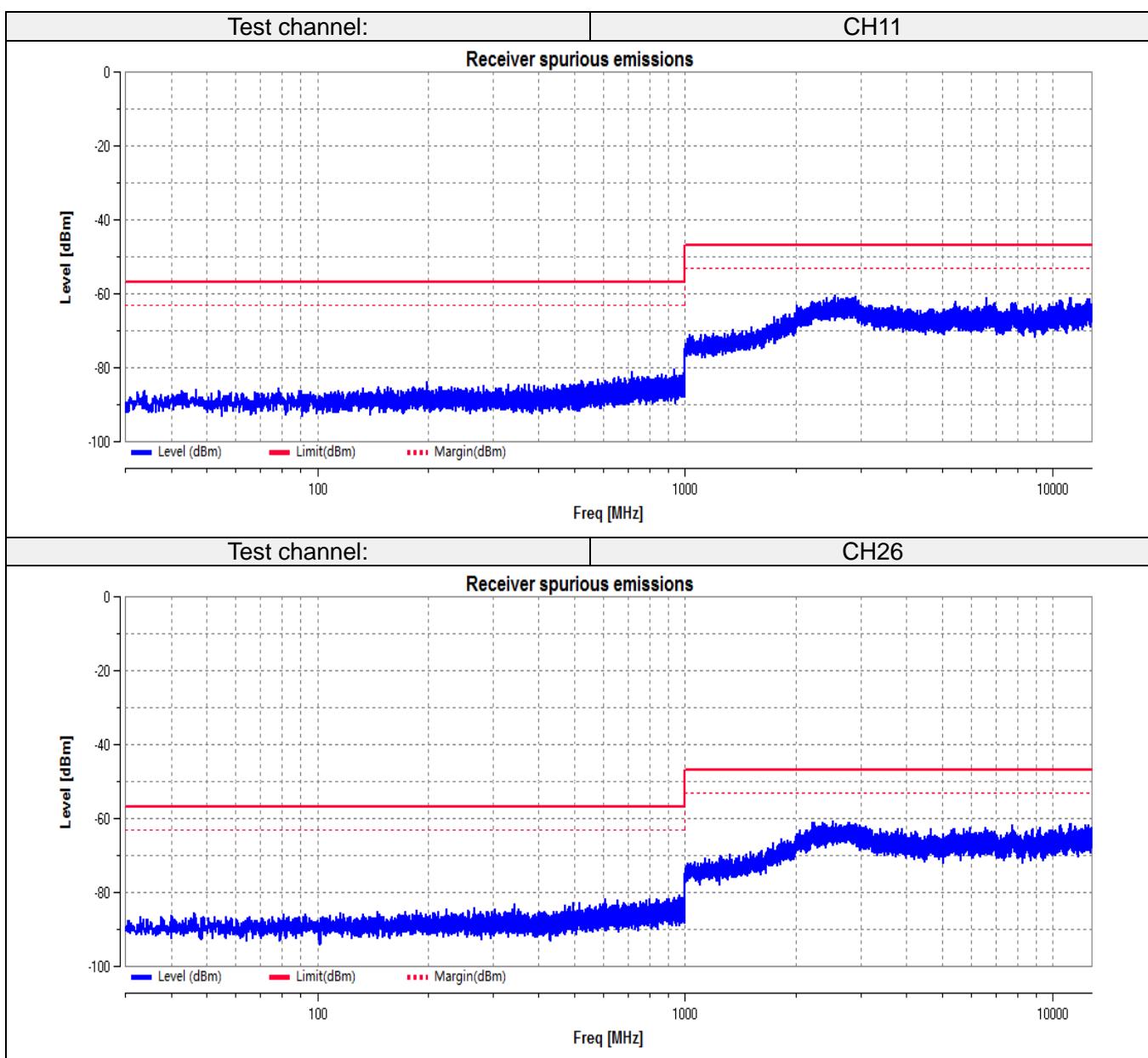
Test Configuration



Test Procedure

Please refer to ETSI EN 300440 Sub-clause 4.3.5 for the measurement method.

Test Result



3.6. Receiver spurious emissions-Radiated measurements

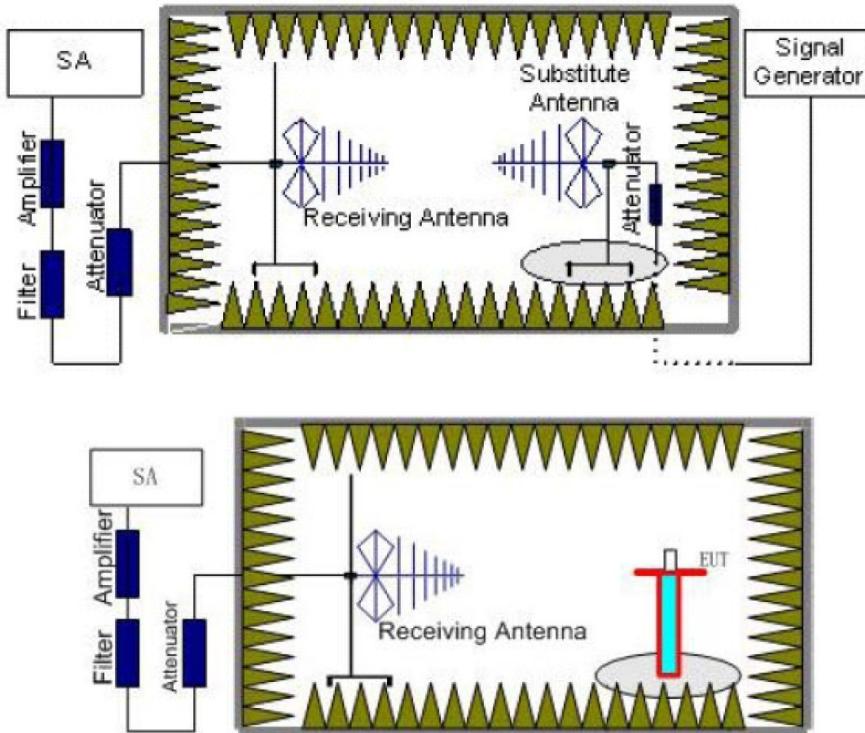
Limit

AS/NZS 4268 Sub-clause 7.2

The spurious emissions of the receiver shall not exceed the values given in the below table

Frequency range	Maximum power	Measurement bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 12.75 GHz	-47 dBm	1 MHz

Test Configuration



Test Procedure

Please refer to ETSI EN 300 328 Sub-clause 5.4.10.2.2 for the measurement method.

Test Result

Note:

- By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "Z axis" position was the worst, and test data recorded in this report.

Channel	Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
		Polarization	Level (dBm)		
LCH	63.31	Vertical	-70.33	-57	Pass
	4810	Vertical	-62.90	-47	
	7215	Vertical	-60.50	-47	
	9620	Vertical	-57.96	-47	
HCH	68.38	Horizontal	-69.54	-57	Pass
	4810	Horizontal	-60.87	-47	
	7215	Horizontal	-58.68	-47	
	9620	Horizontal	-56.51	-47	

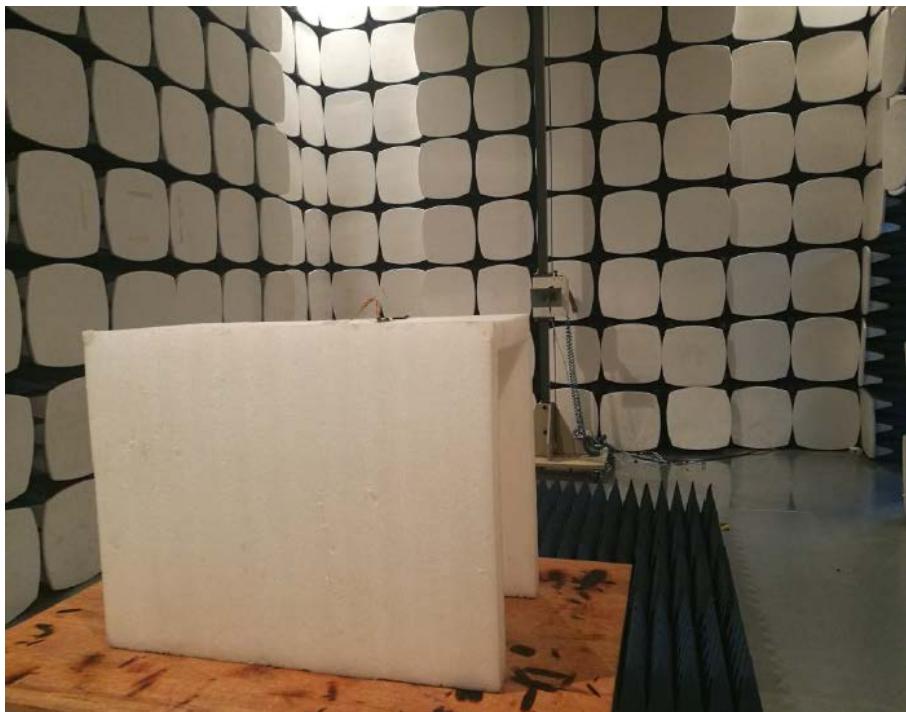
Note: The other emission levels are very lower than the limit and not show in test report.

4. EUT TEST PHOTOS

Radiated Measurements



Below 1GHz



Above 1GHz

*****THE END*****

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